A Laser Based Micrometeorite Accelerator for Impact Studies. D. Marchione[1] , B. M. Jones[1] and T. M. Orlando[1], [1]School of Chemistry & Biochemistry, Georgia Institute of Technology, 901 Atlantic Dr., Atlanta, GA 30332, United States.

Abstract: The chemistry and physical interactions of rocky and icy bodies in the inner and outer solar system are affected by the space weathering (SW). SW includes solar wind, magnetospheric electron and ion bombardment, cosmic ray, thermal excursions and medium velocity (> 3 km/sec) micro-meteorite bombardment [1]. Investigating these energetic and thermal processes at a fundamental level is of utmost importance in order to 1) design new shielding materials for future human exploration of distant surfaces (planets and moons) in the solar system and beyond; 2) process and utilize *in situ* resources; 3) understand life sustainability and survival of biomolecules in harsh conditions. While some of the above energetic phenomena can be simulated easily in the laboratory, developing table-top micrometeorite bombardment systems remains a challenging task. In contrast with more expensive methods (impact testing facilities), we are implementing a novel laser-based technique that was first developed at MIT [2-4].

We will discuss the experimental design (**Figure 1**) of the laser induced micro-particle accelerator (LIMA) and the first results. We also illustrate the use of LIMA under ultrahigh high vacuum conditions that simulate micrometeorite impact events in realistic space environments.

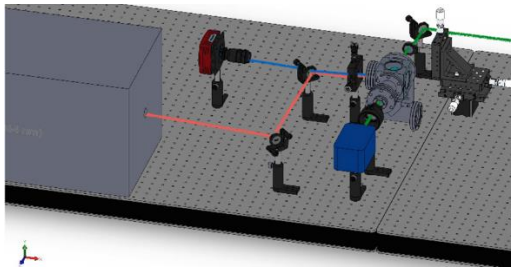

Figure 1*: Schematic that shows the experimental set-up developed to simulate micrometeorite bombardment in vacuum. The green line represents the 532 nm wavelength employed to measure the micro-particles velocity; the 1064 nm wavelength is displayed in red for the sake of clarity and it is employed to launch the micro-particles. The blue beam is the transmitted beam, through the particles holder, coming from an additional illumination (not shown).*

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References: [1] Bennett *et al. Chem. Rev.* 2013, **113**, 9086; [2] Lee *et al. Nat. Commun*. 2012, **3**, Article number: 116; [3] Lee *et al. Science* 2014, **346**, 1092; [4] Veysset *et al*. *Sci. Rep.* 2016, **6**, Article number: 25577.